

WE CLAIM:

1. A method of thermal management in a voltage source inverter, the method comprising:

5 sensing a low output frequency condition;

determining a zero vector modulation responsive to the sensed low output frequency condition; and

applying the determined zero vector modulation to reduce thermal stress in the voltage source inverter.

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2. The method of claim 1, wherein determining the zero vector modulation responsive to the sensed low output frequency condition comprises:
mapping an output voltage requirement to a space vector structure;
and

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determining state switching space vectors based on the mapped output voltage requirement.

3. The method of claim 2, wherein the magnitude of a combination of state switching space vectors is equal to the magnitude of the output voltage requirement.

4. The method of claim 2, wherein determining the state switching space vectors comprise:

- 5 determining active state switching space vectors associated with the state switching space vectors;
- 5 determining duty cycles for the active state switching space vectors based on the active state switching space vectors and the mapped output voltage requirement; and
- 10 determining a duty cycle for at least one zero state switching space vector based on the determined duty cycles of the active state switching space vectors and a switching period.

5. The method of claim 4, wherein the duty cycle for the at least one zero state switching space vectors is selected from the group consisting of: a first 15 zero state duty cycle, a second zero state duty cycle, and a combination of the zero state duty cycles.

6. The method of claim 1, wherein applying the determined zero vector modulation to reduce thermal stress in the voltage source inverter 20 comprises:

- applying a net voltage from the inverter to a load when active state switching space vectors are utilized; and
- applying a shorted voltage from the inverter to the load when zero state switching space vectors are utilized.

7. A computer readable medium storing a computer program comprising:
 - computer readable code for determining a zero vector modulation responsive to a low output frequency condition; and
 - computer readable code for applying the determined zero vector modulation to reduce thermal stress in the voltage source inverter.
- 10 8. The computer readable medium of claim 7, wherein the computer readable code for determining a zero vector modulation responsive to the sensed low output frequency condition comprises:
 - computer readable code for mapping an output voltage requirement to a space vector structure; and
- 15 9. The computer readable medium of claim 8, wherein the magnitude of a combination of state switching space vectors is equal to the magnitude of the output voltage requirement.
- 20 9. The computer readable medium of claim 8, wherein the magnitude of a combination of state switching space vectors is equal to the magnitude of the output voltage requirement.

10. The computer readable medium of claim 8, wherein the computer readable code for determining the switching space vectors comprises:
 - 5 computer readable code for determining active state switching space vectors associated with the state switching space vectors;
 - computer readable code for determining duty cycles for the active state switching space vectors based on the active state switching space vectors and the mapped output voltage requirement; and
 - 10 computer readable code for determining a duty cycle for at least one zero state switching space vector based on the determined duty cycles of the active state switching space vectors and a switching period.
11. The computer readable medium of claim 8, wherein the duty cycle for the at least one zero state switching space vectors is selected from the group consisting of: a first zero state duty cycle, a second zero state duty cycle, and a combination of the zero state duty cycles.
12. The computer readable medium of claim 7, wherein the computer readable code for applying the determined zero vector modulation to reduce thermal stress in the voltage source inverter comprises:
 - 20 computer readable code for applying a net voltage from the inverter to a load when active state switching space vectors are utilized; and
 - computer readable code for applying a shorted voltage from the inverter to the load when zero state switching space vectors are utilized.

13. A system for thermal management in a voltage source inverter, the system comprising:

- means for sensing a low output frequency condition;
- 5 means for determining a zero vector modulation responsive to the sensed low output frequency condition; and
- means for applying the determined zero vector modulation to reduce thermal stress in the voltage source inverter.

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